

# Repeated Games and Reputations

## Long-Run Relationships

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Typos and corrections as of October 9, 2009.<sup>1</sup>

1. page 19, footnote 8 (added 1/9/07): Add parentheses around 1994, theorem 1.6, p.66.
2. page 20 (added 10/24/08): Each  $t + 1$  in the second and third last lines should be  $t$ . (There are three occurrences.)
3. page 27 (added 10/4/06): In the 2nd and 3rd line, the superscript  $T - 1$  of  $\hat{a}$  should be  $T - 2$  in the first terms of the right hand side.
4. page 29 (added 1/9/07): Add “(where  $h^t = (a^0, \dots, a^{t-1})$  and  $h^{t-1} = (a^0, \dots, a^{t-2})$ )” after “defining” just before the displayed equation extending the transition function  $\tau$ .
5. page 30 (added 6/18/2008): Insert “most” before “such” in the fifth line of the second paragraph of remark 2.3.1.
6. page 33 (added 10/19/06): At the end of the fourth line of the proof of proposition 2.4.1, insert the phrase “accessible from  $w^0$ ” after “for every  $w \in \mathcal{W}$ ” and before the comma.  
Similarly, three lines before equation (2.4.3), insert the phrase “accessible from  $w^0$ ” after “for every  $\hat{w} \in \mathcal{W}$ ” and before the comma.
7. page 34 (added 1/2/07): Insert “induced by the automaton” after “the strategy profile” in the first line of proposition 2.4.2.
8. page 37 (added 10/4/06): In Definition 2.5.2, add “for all  $i$ ” after “such that”.
9. page 41 (added 1/2/07): In the third last line of the first paragraph of section 2.5.3, replace “equilibria” with “equilibrium payoffs”.

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10. page 51 (added 1/9/07): In the fourth line of the first paragraph of section 2.6, replace “decomposable” by “enforceable”. In the ninth line of the same paragraph, replace “decomposed” by “enforced”.
11. page 52 (added 10/4/06): In equation 2.6.1, the max should be with respect to  $a_i \in A_i \setminus \{a_i^t(j)\}$ .
12. page 52 (added 1/9/07): In the second line after remark 2.6.1, move “ $\{\mathbf{a}(1), \dots, \mathbf{a}(n)\}$ ” from before “describing” to after “responses”, so that the phrase reads “...a *penal code* describing responses  $\{\mathbf{a}(1), \dots, \mathbf{a}(n)\}$  to deviations...”
13. page 52 (added 10/4/06): Since  $\mathcal{E}^P$  is the set of pure strategy subgame-perfect equilibrium payoffs, not profiles, the displayed equation just before definition 2.6.2 should read

$$v_i^* = \min\{v_i : v \in \mathcal{E}^P\}$$

14. page 53 (corrected 11/20/06): For a similar reason, the third and fourth lines should be replaced by

*is an optimal penal code if, for each  $i$ , the strategy profile  $\sigma(i)$  is a subgame-perfect equilibrium.*
15. page 53 (added 1/9/07): In the third line before proposition 2.6.1, replace “theorem” by “proposition”.
16. page 53 (added 10/4/06): Near the end of 4th line in the proof of proposition 2.6.1,  $U_i(\hat{\sigma}_i)$  should be replaced by  $U_i(\hat{\sigma}(i))$ .
17. page 53 (added 1/9/07): In the line immediately preceding equation (2.6.3) and in the last line on the page, replace  $a_i \in A_i$  by  $a_i \in A_i \setminus \{a_i^t(j)\}$ .
18. page 54 (added 10/4/06): In the first term of the right hand side of equation (2.6.4), there is a missing superscript  $t$  on the  $a_{-i}(j)$ .
19. page 54 (added 5/10/09): In the second sentence of corollary 2.6.1, replace the phrase “where each  $\mathbf{a}(i) \dots$  to player  $i$ ,” with ‘where each  $\mathbf{a}(i)$  is the outcome path of a subgame-perfect equilibrium yielding the lowest possible payoff of  $v_i^*$  to player  $i$ ’.
20. pages 56-57 (added 1/9/07): In the paragraph spanning pages 56 and 57, replace  $\bar{q}$  by  $\hat{q}$ .

In the first line of statement 2 of proposition 2.6.2, insert  $\sigma(\bar{q}, \hat{q})$  between “punishment” and “satisfies”.

21. page 57 (added 1/9/07): in the second line of statement 3 of proposition 2.6.2, replace “outcome” by “payoff”.
22. page 58 (added 9/24/09): in second displayed equation, insert  $\delta$  before  $U$ .
23. page 63 (added 10/4/06): In the 8th line from the beginning of subsection 2.7.1,  $(\alpha_{LL}, \alpha_{SL}) \in \mathbf{B}$  should be replaced by  $(\alpha_{LL}, \alpha_{SL}) \in \mathbf{B}$ .
24. page 83 (added 2/22/07): second line after remark 3.4.1,  $\mathcal{A}$  should be  $A$ .
25. page 83, footnote 8 (added 3/14/2008): The dimension of a convex set is the dimension of the smallest affine set containing it. A set  $\mathcal{A} \subset \mathbb{R}^n$  is *affine* if for all  $x, y \in \mathcal{A}$  and  $r \in \mathbb{R}$ , we have  $rx + (1 - r)y \in \mathcal{A}$  (and so affine sets are translations of subspaces).
26. page 84 (added 2/23/07): in the seventh line of the proof of proposition 3.4.1, replace “is the profile” with “is a profile”.
27. page 90 (added 12/3/08): In the displayed equation defining  $f_i$ , there should be a superscript  $\dagger$  on  $\mathcal{F}$ .
28. page 91 (added 4/28/2008) Rewrite footnote 15 to read:

The argument presented in this section is based on Fudenberg, Kreps, and Maskin (1990). Public correlation allows a simpler argument; see again Fudenberg, Kreps, and Maskin (1990).

29. page 116 (added 1/15/07): Insert “subgame-” before “perfect” in the third line of proposition 4.4.2.
30. page 181 (added 12/15/08): In the fourth line of the last paragraph, insert “marginal” so that the sentence reads “We interpret  $f(x)$  as the *instantaneous* marginal valuation...” Two lines later, replace “value *per unit*” with “marginal value”. In the displayed equation, in the first line replace

$$F(x) = \int_0^\Delta f(xe^{-\eta s})e^{-(r+\eta)s} ds$$

with

$$F(x) = \frac{d}{dx} \left\{ \int_0^\Delta \int_0^{xe^{-\eta s}} f(x') dx' e^{-rs} ds \right\} = \int_0^\Delta f(xe^{-\eta s}) e^{-(r+\eta)s} ds$$

31. page 182 (added 1/15/07): In the 19<sup>th</sup> line, replace “t+2” by “t+1” and in the next line, replace  $t + 3$  by  $t + 2$ .

32. page 187 (added 1/15/07): In the second line, replace “section 5.6” by “section 5.5”.
33. page 187 (added 1/15/07): In each of the last two lines of text, there is one  $\mathbb{H}$  missing a subscript  $i$ .
34. page 188 (added 1/15/07): In the 13<sup>th</sup> line, replace “payoffs” with “strategies”.
35. page 227: Add “See also note 5 on page 229.” to the end of note 2.
36. page 230 (added 1/9/07): Add “(where  $h^t = (h^{t-1}, y^{t-1})$ ” after “defining” just before the displayed equation extending the transition function  $\tau$ .
37. page 242 (added 7/15/09): In the caption of Figure 7.3.1,  $V(\alpha, \gamma)$  should be  $V(a, \gamma)$ .
38. page 243 (added 1/9/07): In definition 7.3.2, insert “, for all  $i$ ,” after “such that” just before the displayed equation.
39. page 245 (added 1/22/07): In the 14<sup>th</sup> line, replace “the automaton,  $(\mathcal{W}, v, f, \tau)$ ,” by “automata  $(\mathcal{B}(\mathcal{W}), v, f, \tau)$ ,”.
40. page 267 (added 7/15/09): In the last sentence before Remark 7.7.2, add “symmetric” before “pure-action” and before “mixed-action”.
41. page 271 (added 2/16/07): In lines 12-13, replace the sentence “From (7.8.1), we immediately get an upper bound less than 1.” with the sentence  
Consequently, for large  $N$ , (7.2.16) is violated, and the profile is not a PPE.
42. page 271 (added 5/8/09): The displayed equation for  $p - q$  is missing the term
- $$+ \frac{(N-1)!}{\kappa!(N-1-\kappa)!} \varepsilon^\kappa (1-\varepsilon)^{N-1-\kappa}$$
- in the second line. The expression in the third line is correct.
43. page 274 (added 1/29/07): In the first line, insert “ $\setminus \{\mathbf{0}\}$ ” after “ $\mathbb{R}^n$ ”, so that it reads “direction  $\lambda \in \mathbb{R}^n \setminus \{\mathbf{0}\}$ ”.
44. page 279 (added 1/29/07): In the 8<sup>th</sup> line of the proof, insert “of” after “support”.

45. page 281 (added 2/22/08): In the second last and third last lines of the proof of proposition 8.3.1,  $a'_i$  should be  $a''_i$ . (While correct as written, there is a potential for confusion, since earlier in the proof,  $a'_i \in \text{supp}(\bar{\alpha}_i)$ , while here we only require  $a'_i \in A_i$ .)
46. page 296, footnote 5 (added 10/24/06): The undecorated  $\gamma$  is missing a  $\hat{\cdot}$ ; the equality should read  $F(\hat{\gamma} - \gamma^\delta) \cdot F(\hat{\gamma} - \gamma^\delta) = 0$ .
47. page 302 (added 9/24/08): In the second line of equation 9.2.4, “-1” should be “+1”.
48. page 308 (added 9/15/08): Claim 9.4.3 is false, and there does not appear to be an easy way to patch the proof Lemma 9.4.2. An alternative proof can be found at <http://www.econ.upenn.edu/~mailath/book/lemma942.pdf>.
49. page 312, proposition 9.6.1 (added 3/6/07): Insert  $\sigma$  after “strategy profile” in the first line.
50. page 312, definition 9.6.3 (added 3/6/07): Insert “, for all  $i$ ,” after “such that” just before displayed equation.
51. page 313 (added 1/29/07): In lines 8, 17, and 18, replace  $\kappa^*$  by  $k^*$  (there are a total of 4 replacements).
52. page 347 (added 1/11/07): In the second line from the bottom, replace “the action profile  $a$ ” with “its action  $a_i$ ”, and in the following displayed equation, insert a subscript  $i$  on the first  $a$ .
53. page 348 (added 1/11/07): Insert a subscript  $i$  on the first  $a$  argument of the integrand.
54. page 396: In the beginning of remark 12.2.4, replace “Using automata,” with “Following Mailath and Morris (2002, 2005),” and add 396 to the Mailath and Morris index entries.
55. page 397 (added 5/9/08): In the line preceding the displayed equation in Proposition 12.2.3, add “for all  $i$  and ” immediately after “...only if,” so that it reads “...only if, for all  $i$  and for all  $h_i^t$ ...”
56. page 433 (added 8/1/08): In the second line after the last displayed equation, there is a bad line break: Move  $\ln \pi_i$  to the beginning of the next line.
57. page 443 (added 11/15/06): Insert the following sentence before the first sentence of remark 13.6.1: “When  $n = 2$ , we obtain a folk theorem by taking

$a$  to be mutual minmax.” In what is now the second sentence, delete “of the result” and insert “for  $n \geq 3$ ” just after “theorem”.

58. page 446, remark 14.1.1 (added 4/04/07): In the first line, insert “ $n = 2$  and” after “Suppose” and replace “ $\dots, n$ ” with “2”. In last line of the remark, replace  $\prod_{i=1}^n \mathcal{V}_i$  with  $\mathcal{V}_1 \times \mathcal{V}_2$ .
59. page 449 (corrected 11/20/06): In the line immediately after equation (14.1.13), insert “symmetric” before “pair” and before “belief-free”.  
Insert “(possibly asymmetric)” before “belief-free” in the second line of corollary 14.1.1.
60. page 452: Missing subscript  $i$  on last  $\mathcal{W}$  in equation (14.1.14).
61. page 452 (added 05/31/07): Add at the end of the second line at the top of the page: “Suppose  $Z_i(a_i E) \cup Z_i(a_i S) = Z_i$  for all  $a_i$ .”  
In equation (14.1.16),  $a_i E$  should be  $a'_i E$  and  $a_i S$  should be  $a'_i S$ , i.e., the two  $a_i$ 's on the right hand side of (14.1.16) are missing primes.
62. page 460 (added 07/11/07): In the second full paragraph, third line, insert “payoffs” after “equilibrium.”
63. page 486 (added 04/02/07): Just before the last displayed equation, after “We then have” insert “(where  $\tilde{E}$  denotes expectation with respect to  $\tilde{\mathbf{P}}$ )”.
64. page 492 (added 04/02/07): In the last sentence of the second last paragraph, the phrase “the model is formally equivalent to” should be replaced by “the analysis is essentially identical to that in”.
65. page 500 (added 04/02/07): Just before lemma 15.6.1, at the end of the paragraph, insert “Let  $\tilde{E}$  again denote expectation with respect to  $\tilde{\mathbf{P}}$ .”
66. page 509 (added 3/6/07): In the fourth paragraph, replace the sentence “By (15.6.10), he expects player 2 to play within  $v < \bar{v}$  of  $\hat{a}_2$  for the next  $\tau$  periods.” with  
For  $v$  sufficiently small, because each of the (finitely many)  $\tau$  length histories of public signals has strictly positive probability, (15.6.10) implies that player 1 expects player 2 to play within  $\bar{v}$  of  $\hat{a}_2$  for the next  $\tau$  periods, irrespective of his own behavior.
67. page 532 (added 9/4/07): In the displayed equation in proposition 16.5.1,  $y$  is missing a subscript 1.

68. page 541 (added 10/9/09): The year in the Cripps, Dekel, and Pesendorfer citation should be (2005), not (2004).
69. page 543 (added 10/9/09): The year in the Cripps, Dekel, and Pesendorfer citation should be (2005), not (2004).
70. page 622 (added 10/9/09): The year in the Cripps, Dekel, and Pesendorfer publication should be (2005), not (2004).
71. page 626: In Mertens, Sorin, and Zamir reference, “Chatholique” should be “Catholique”.
72. page 643 (added 10/19/07): In the Schmidt index entry, 547 should be 546.